INSTRUCTION MANUAL

IEC - 833

RS - 170A SYNC GENERATOR

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IEC-833 GENERAL DESCRIPTION

LINK's IEC-833 is a professional RS-170A broadcast master sync generator with multifunction genlock capability. The IEC-833 outputs two signals each of Sync and Subcarrier, and one output each of Color Bars, Black Burst, Burst Flag, H-Drive, V-Drive, and Blanking. The Color Bar output is standard SMPTE Align/Test color bar signal.

The multifunction genlock feature includes Standard/Helical lock modes and a special PC Lock mode which allows the IEC-833 to color lock to a monochrome signal or to a sync pulse. In this mode, subcarrier is hard RS-170A locked to horizontal.

Other IEC-833 features include:

Standard 19" rack mounting
Front panel indicators for:
- Video Presence
- Burst Presence
- Lock Status

Front panel subcarrier phase adjustment, 360°.
Front panel horizontal, ±4US.
Operation for 15,734 Horizontal & 59.94 Vertical.

IEC-833 SPECIFICATIONS

PULSES:

Outputs:

Sync . . . . . Two (2)
Blanking: . . . . . One (1)
H. Drive: . . . . . One (1)
V. Drive: . . . . . One (1)
Burst Flag: . . . . . One(1)
Levels: . . . . . 4.0 Vpp ±5% fixed
Impedance: . . . . . 75**S**, ±1%, source term.
Widths: . . . . . Norm FCC, EIA & NTSC
Tilt & Overshoot: . . . . . <1%
Jitter: . . . . . <5nS, reference to Subcarrier
Rise Time: . . . . . 140nS ±20nS

SUBCARRIER:

Outputs: . . . . . Two (2)
Frequency: . . . . . 3.579545 MHz ±1Hz
Output Impedance: . . . . . 75**S**±1%
Output Level: . . . . . 2.0 Vp-p adj. ±20%
Harmonic Distortion: . . . . . >-45dB @ 2Vp-p

GEN-LOCK MODE:

Video Level: . . . . . 1.0Vp-p ±6dB
Video Input Impedance: . . . . . >20K loop
Pulse Jitter: . . . . . <5nS, ref to in sync
Subcarrier Jitter: . . . . . <0.5
Color Lock Range: . . . . . ±4 Hz

BLACKBURST:

Outputs: . . . . . One (1)
Impedance: . . . . . 75**S**, ±1 % source term.
Tilt & Overshoot: . . . . . < 1 %
Subcarrier Jitter: . . . . . <5nS, ref. to SC
S/N Ratio: . . . . . > 66dB

COLOR BARS:

Outputs: . . . . . One (1)
Type: . . . . . Standard SMPTE Bars

FRONT PANEL CONTROLS:

Subcarrier Phase: . . . . . 360°
Horizontal Phase: . . . . . ±3.5µS
Crystal Frequency: . . . . . ±3Hz at 3.579545MHz

INTERNAL CONTROLS:

Factory set: . . . . . There are 27 internal controls

ENVIRONMENTAL:

Temperature: . . . . . 0 to 50 C, Ambient
Power: . . . . . 12 watts

MECHANICAL:

Height: . . . . . 1.75 Inches
Width: . . . . . 19 Inches
Depth: . . . . . 8 Inches
Weight: . . . . . 4.75 Pounds

IEC-833 INSTALLATION AND SETUP

The IEC-833 can be used as a Genlock or a Master generator in your system. If every source in your system will lock to an external feed, then you would want to choose the Master mode. Flip the front panel switch to the INT position, meaning that you will be running on the internal 14.3 MHz crystal. None of the front panel lights will be lit, and only the INT FREQ control will function. This control has been factory set and should not need adjustment. If you want to check its calibration, run the rear panel output marked SC (3.58 MHz Subcarrier) into a Frequency Counter and set it to 14.31818 MHz by carefully calibrating the INT FREQ control.

Now we are ready to connect the rear panel feeds to your system. There are 10 outputs to choose from. As you look at the unit from the rear, the first two on the left is CB (Color Bars) and BB (Blackburst). The CB can be connected to your equipment as a Test Signal or laid down on tape before recording. The BB feed should run to any equipment in your system that requires Blackburst as a reference. You may also have some equipment that requires drive pulses and the other 8 feeds should be used for these. You might also want to run SY (Sync) to your waveform monitor and SC (Subcarrier) to your vectorscope as a reference.

If you have a piece of equipment that will not lock to an external feed, you may choose to let it be the Master for your system and have the IEC-833 Genlock to it. Use some caution here because its crystal may not be stable enough to operate your system without problems. The IEC-833 is RS-170A which means, in part, that it has a very stable time base.

To Genlock to another unit, run its output into the rear panel input on the IEC-833 marked VIDEO IN. The two connections are loop-thru inputs so you can still drive another source. If the input is Composite Video, containing both burst and sync information, flip the front panel switch to the LOCK position. The BURST and VIDEO indicators should light up confirming your connection. If the input is a Sync Pulse or a Black and White video (no burst), flip the switch to the PC Lock position. Only the VIDEO indicator will light. By using this PC LOCK mode, you can lock the IEC-833's 3.58 MHz outputs to the incoming sync. In either lock mode, the SC PHASE and HORIZ PHASE controls are activated. By using a vectorscope and waveform monitor, these two controls will allow you to phase match the IEC-833's color/sync outputs to the input signal you are locking to. Keep in mind that the SC PHASE and HORIZ PHASE will control all 10 outputs simultaneously and cannot be controlled individually.

IEC-833 TECHNICAL DESCRIPTION

The ***LINK*** IEC-833 Sync Generator contains within it four primary functional elements; Gen-Lock Processor, Sync Pulse Generator, Black Burst Encoder, Color Bar Encoder.

Section 1. Gen-Lock Processor:

This system is designed to lock to any NTSC composite video signal and force the Sync Generator section to conform to the phase and timing relations inherent in the incoming signal. In order to do this, six subsystems are required; 1. Video AGC, 2. Horizontal Processing, 3. Vertical Separator, 4. Burst Processing, 5. Subcarrier Processing, 6. Status Detect and Display.

1. VIDEO AGC:
   Incoming video is buffered by Q1, delivered to pin 1 of U1, VCA. The gain of U1 is controlled by the voltage on pin 2. The VCA output is notch filtered by L2, C4 and common base amplified by Q2. The signal is buffered by Q3 and back porch clamped at -0.6V by D1, Q4, Q5 and Q9. Q6, Q7 and Q8 provide for burst gating. Clamped video is rebuffered by Q10, Q11. D2 and C8 detect and store the peak sync tip voltage which is then buffered by U2A which then closes the VCA loop by providing this voltage to pin 2 of U1. This AGC action guarantees that the 50% point of sync will correspond to the turn on point of Q13 which provides a precision sync strip signal source for the other onboard systems.

2. HORIZONTAL PROCESSING:
   Stripped Sync is provided to a multi vibrator, U3A, which locks out the 31.5 KHz portion of the vertical interval. This corrected signal is provided to a second multi vibrator, U3B, that can be adjusted over a 9 microsecond range using the frontpanel mounted variable resister R36 (H PHASE). Q16 and Q17 combine the pulses from U3A and U3B in order to form a 50% duty cycle horizontal rate pulse with a tamable rising edge. C18 sets the leading edge rise time to a 2 microsecond interval in order to facilitate PLL sampling in the horizontal AFC. This horizontal ramp is sampled by Q18, the sample voltage is stored in C19 and buffered by U4A. The bilateral switch U5B applies this voltage to the oscillator section of the sync chip U11 in order to control its horizontal output frequency. The trailing edge of the horizontal pulse on pin 18 of U11 is used to create the sample drive to the gate of Q18 completing the AFC loop.

3. VERTICAL SEPARATOR:
   Q14 integrates the stripped composite sync derived from incoming video. This process creates a positive pulse at vertical sync. D4, C16, and Q15 create from this a short negative going pulse that is applied to pin 19 of U11 in order to reset the vertical counter.

IEC-833 TECHNICAL DESCRIPTION CON'T

4. BURST PROCESSING:
The burst AGC uses a VCA, U6, in a manor similar to the video AGC. The gated burst is coupled to pin 1 via C9. The output pin 7 of U6 is amplified by Q20, Q21, then peak detected with D5 and D6. U7A buffers the detected voltage and closes the loop by applying this voltage to control pin 2 of the VCA U6. Q22 precision rectifies the burst and Q23 shapes this output into a pulse. Q24 shortens the pulse by half and Q25 generates from this, a sample pulse that hits the center of burst.

5. SUBCARRIER PROCESSING:
The subcarrier AGC uses a VCA, U8, as a synchronous demodulator. It receives burst on pin 1 and internally generated subcarrier on pin 2. The demodulated signal on pin 7 is buffered by U9A and clamped to ground during burst by Q25 charging C35. U7B acts to deliver the sample voltage to the 14.3 MHz master oscillator as a VCO control signal. The subcarrier can be shifted 360 degrees with the use of frontpanel control SC PHASE, R68 controlling the DC bias on varicap diodes D10, D11, D12 in conjunction with filter circuits around Q26, Q27, Q28 which insert a phase offset in the AFC loop.

6 STATUS DETECT AND DISPLAY
The PROM U10 detects the condition of the frontpanel switch settings as well as the internal condition of the circuit and uses this information to set the operating parameters of the unit by controlling the bilateral switches in U5 as well as the three frontpanel status indicators. A video presence detector employs an op-amp, U2B, to sense gain boost in the video AGC. Improper gain parameters cause an indication of "No Video" (VIDEO light off). A similar detection means is employed involving the burst AGC for the determination of "Monochrome" (Burst light off). The LOCK light indicates the condition of LOCK switch but does not guarantee that lock has been achieved.

SECTION 2. SYNC PULSE GENERATOR:

The heart of this system is the sync chip U11. This I.C. creates all output pulses as well as internal pulses required for Gen-Lock. It does this by accepting a 14.3 MHz clock signal from the Master Clock Oscillator module Y1 and using internal divide counters to time out the pulses. The master clock is a high performance VCO that accepts its voltage control signal from one of three sources that accepts its voltage control signal from one of three sources depending upon the system operating status. If the LOCK switch is set to INTERNAL, this control voltage is developed by the front panel frequency trim R45 via R46. If the LOCK switch is set to LOCK, the burst lock circuit provides the control voltage via D22 and U5C. If the LOCK switch is set to PC LOCK, the control voltage is obtained from the horizontal lock circuit via U4A and U5D.

U11 also operates a second LC oscillator at 4.09 MHz (260 times horizontal), frequency controlled the DC applied to vericap diode D13. This voltage can be supplied from two locations. If the unit is in one of the two Gen-Lock modes, (LOCK or PC LOCK) and a Gen-Lockable video input is present, the control voltage will be supplied by the sample and hold op-amp U4B via U5B. If the unit is in Gen-Lock, the control voltage will be supplied by U11 and horizontal will be locked to subcarrier internally.

The horizontal and vertical pulses are connected to a JK flip-flop U12A in order to detect odd fields. This pulse rate is further divided by 2 by U12B in toggle mode creating a 15 Hz pulse that arbitrarily determines color field one. The line switch out, pin 20 of U11 is set to zero at the leading edge of this pulse. At the same time, U12 forces U11 into PAL mode for a very short time causing an internal counter reset in U11. If the counters are already set to zero at this time as they should be, the subcarrier to horizontal relation will stabilize. If not, U11 will continue to seek the correct condition in discrete steps until it succeeds and the subcarrier to horizontal relation will again stabilize. In this manor, U11 will always recover the exact SC-H relation on power up.

The remainder of the generator system consists of output driver cells. Subcarrier is buffered with a push pull line driver and LC band pass filter, L5, C57. The pulse output cells consist of a TTL gate, a common base DC translator and a common emitter amplifier. A Miller capacitor sets the rise time to 120 nanoseconds.

SECTION 3. BLACK BURST ENCODER:

Subcarrier and burst flag are received from the sync generator's output cells and used by the modulator U201 to produce burst. It is filtered by components L201 through R216. Q201 is a buffer which sends the burst to the output cell. Sync and blanking from the sync generator's output cells are added together in the two transistor amplifier Q202 and Q203 and sent to the output cell. The black burst generator's output cell consists of five transistors Q205 through Q209 and is a conventional push pull line driver.

IEC-833 TECHNICAL DESCRIPTION CON'T

SECTION 4. COLOR BAR ENCODER:

The various components of the color bar signal are stored in the prom U207. The addressing of the prom starts with horizontal drive controlling an oscillator U204B and U204A. The oscillator drives the address counters U205 and U206. The data from U207 is gated by blanking in U208 and buffered by U209.

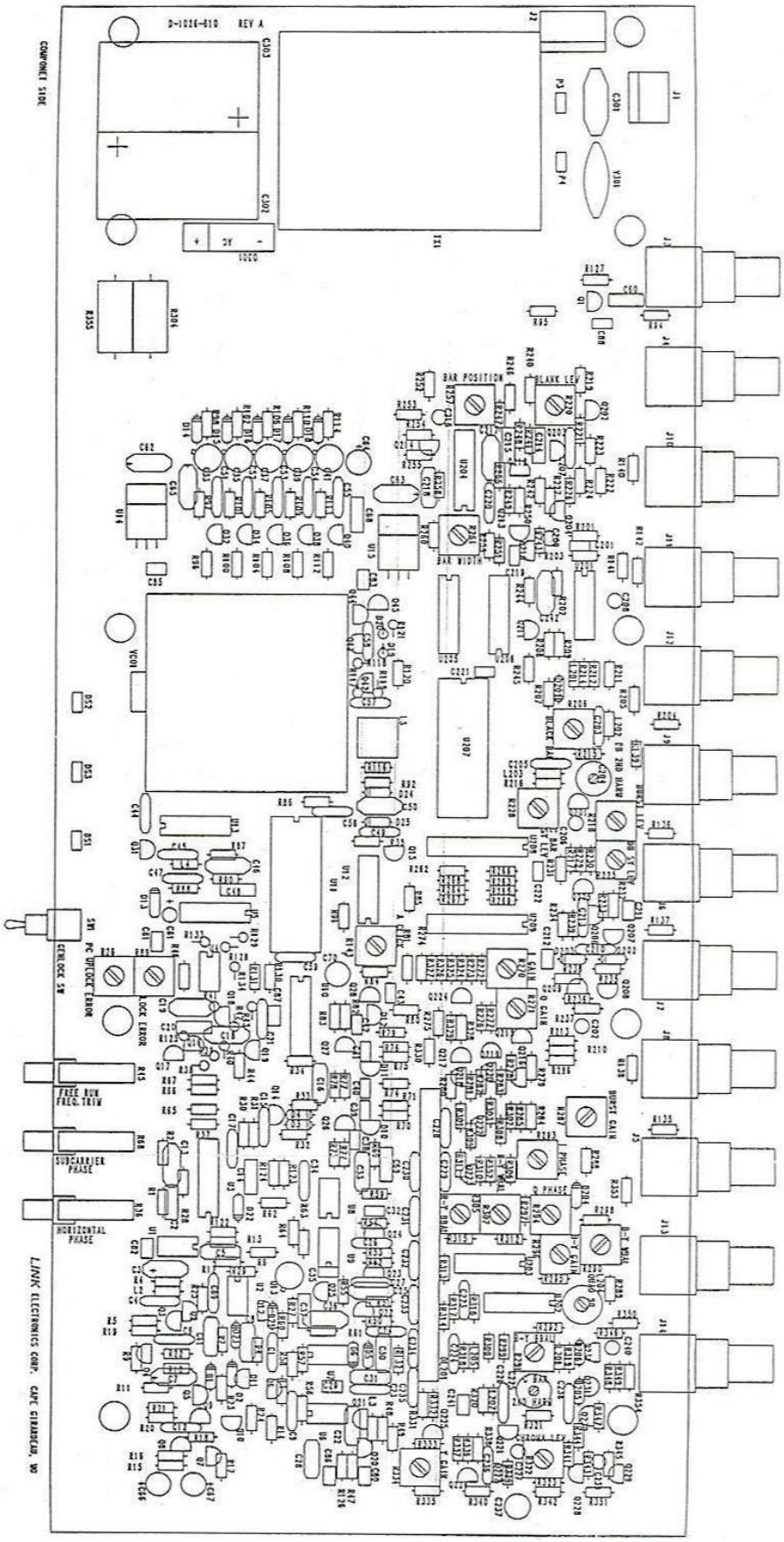
The blue, green, and red signal are buffered again by their emitter follower pairs. R285, R301, and R303 create a Y matrix. This signal is buffered by Q222 and added with -plug, +plug, and the Y bar at the base of Q224, the delay line driver. After being gain set by R334 the Y signal is available for the output cell at the collector of Q227.

U202 is the B-Y modulator. It receives at pin 1, red and Q bar; at pin 4, the Y signal and I bar; at pin 8, subcarrier. The out put of the modulators is pin 12. The signals are added and filtered by components L205 through R320. Q221 is an emitter follower which sends the chroma to the output cell.

The color bars output cell receives sync and set up from Q204 along with the Y signal and chroma. The cell consists of five transistors Q228 through Q232 and is conventional push pull line driver.

THE POWER SUPPLY:

This system operates from a plus 5 volt supply provided by the regulator U14 and a minus 8 volt supply provided by the regulator U15. A conventional transformer and full-wave rectifier bridge is used.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COMPONENT SIDE
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FC UNLOCK ERROR
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FREE RUN FREQ. TRIM
SUBCARRIER PHASE
HORIZONTAL PHASE
BAR POSITION
BLANK LEV
BAR WIDTH
BURST GAIN
I PHASE
Q PHASE
LINK ELECTRONICS CORP. CAPE GIRARDEAU, MO

Product Warranty

Link Electronics warrants its product to be free from defective material and workmanship for a period of TEN YEARS from date of shipment, including parts and labor to the original customer who purchased the product. The length of the warranty may be different with some products, as noted in “Exclusion A” below, but the following restrictions apply to all products.

This warranty does not extend to products which have been subjected to misuse, neglect, accident or act of nature, incorrect wiring, alteration, improper installation, or used in violation of instructions from Link Electronics. Link Electronics makes no other warranties, express or implied, of merchantability, fitness for a particular purpose, or otherwise. Link Electronics liability for any cause, including breach of contract, breach of warranty, or negligence, with respect to products sold by Link Electronics is limited to repair or replacement by Link Electronics, at its sole discretion.

The product must be shipped to Link Electronics, freight costs prepaid. Labor will be performed at the Link Electronics factory in Branson, MO. Repaired or replaced equipment shall be returned by ground/standard freight, unless customer wants to pay for expedited freight. Shipping outside of the contiguous US is at the customers expense including all duties and tax. This warranty is in lieu of all other warranties, expressed or implied, with respect to the condition or performance of any Link Electronics products, its merchantability, or fitness for a particular purpose.

The product warranty will be null and void, if a specific component part should become obsolete by the parts manufacturer. If the component part becomes obsolete and not available through distribution, Link Electronics will not be responsible for repair or replacement of a Link Electronics manufactured product.

Any repair outside of warranty will be quoted at the time of service request, if repair is possible. In no event shall Link Electronics be liable for any incidental or consequential damages, including loss of profits. This warranty supersedes all previous warranties, whether implied, written or verbal.

SERVICE INFORMATION

In the event that the Link Electronics equipment should fail, you should contact the Customer Service Department and request a Return Authorization (RA) number. At that time, the details of how the repair should be processed will be discussed. All inquiries relating to either parts replacement or warranty ser-vice should be directed to:

LINK ELECTRONICS
2709 State Hwy 248 Branson, MO 65616
Phone: 417-320-3438 Fax: 417-222-3493

EXCLUSION A

Some of the product line is affected by outside factors that LINK ELECTRONICS cannot control. These products have a limited time for the parts and labor warranty. They are, but not limited to:

ACE Series	1 year	Cable Assemblies	2 years
HCC-62	1 year	Modems for Caption Encoders	2 years
		All through XL Series Routers	2 years

1 KHZ TONE GENERATOR BOARD
IEC-833 OPTION 1: GENERAL DESCRIPTION

The IEC-833 Opt. 1 is a high quality audio tone generator. It features a stable 1kHz balanced, low impedance output. The performance of the IEC-833 Opt. 1 is outstanding. Total Harmonic Distortion is <0.06% and Signal to Noise Ratio is >95db. The output amplifier features a unique cross-coupled feedback configuration for precise phase and level matching of the balanced output. High-performance, low-noise audio ICs are employed as line drivers. The output connector is a spring activated terminal block with force-multiplying hinge action. Despite its compact size, the IEC-833 Option 1 offers big performance and is covered by Link's standard 10 year warranty.

IEC-833 OPTION 1: SPECIFICATIONS

OUTPUT:

NUMBER . . . . . ONE

CONFIGURATION . . . . . BALANCED

IMPEDANCE . . . . . 66 Ohms

FREQUENCY . . . . . 1kHz +/-lHz

FREQ. ADJUSTMENT RANGE . . . . . +/-200HZ

LEVEL . . . . . 0dBm +/-0.IdB

LEVEL ADJUSTMENT RANGE . . . . . +3dB/-6dB

TOTAL HARMONIC DISTORTION . . . . . <0.06%

SIGNAL TO NOISE RATIO . . . . . >95db

CONNECTOR . . . . . Spring-Activated Terminal Block

IEC-833 OPTION 1: INSTALLATION PROCEDURE

THERE IS NO INSTALLATION PROCEDURE BECAUSE THE OPTION 1 IS A FACTORY MODIFICATION ONLY. WHEN YOU RECEIVE YOUR IEC-833, THE OPTION 1 TONE GENERATOR SHOULD BE OPERATIONAL AND READY FOR USE. IF YOU FEEL THAT IT SHOULD NEED CALIBRATION, THE SET-UP DESCRIBED BELOW CAN BE UTILIZED.

IEC-833 OPTION 1: SET-UP PROCEDURE

1. MID-RANGE ALL POTS. SLOWLY POWER-UP UNIT USING A VARI-AC WITH CURRENT METER, CHECKING FOR EXCESSIVE CURRENT.

2. CHECK THE TERMINAL BLOCK FOR BALANCED AUDIO OUTPUT.

3. FEED THE AUDIO OUTPUT OF THE 833 TO A FREQUENCY COUNTER (OR AN OSCILLOSCOPE WITH BUILT-IN FREQUENCY COUNTER) AND ADJUST R06 FOR 1kHz +/-1HZ. ALTERNATE METHOD OF FREQUENCY ADJUSTMENT: CONNECT THE AUDIO OUTPUT OF THE 833 TO THE OSCILLOSCOPE. TO THE OTHER CHANNEL OF THE OSCILLOSCOPE, CONNECT THE OUTPUT OF A REFERENCE AUDIO ANALYZER SUCH AS THE SOUND TECHNOLOGY 1710A. SET THE REF. ANALYZER TO PROVIDE A 1kHz SIGNAL. VIEW BOTH SIGNALS ON THE 0-SCOPE, LOCKING THE 0-SCOPE TO EITHER SIGNAL. ADJUST R06 SUCH THAT THE TWO SIGNALS MOVE PAST EACH OTHER VERY SLOWLY.

4. WITH 600 OHM LOAD IN PLACE, CONNECT THE 833'S 1kHz TONE OUTPUT TO THE AUDIO ANALYZER AND ADJUST R021 FOR. 0dBm OUTPUT LEVEL (0.775Vrms).

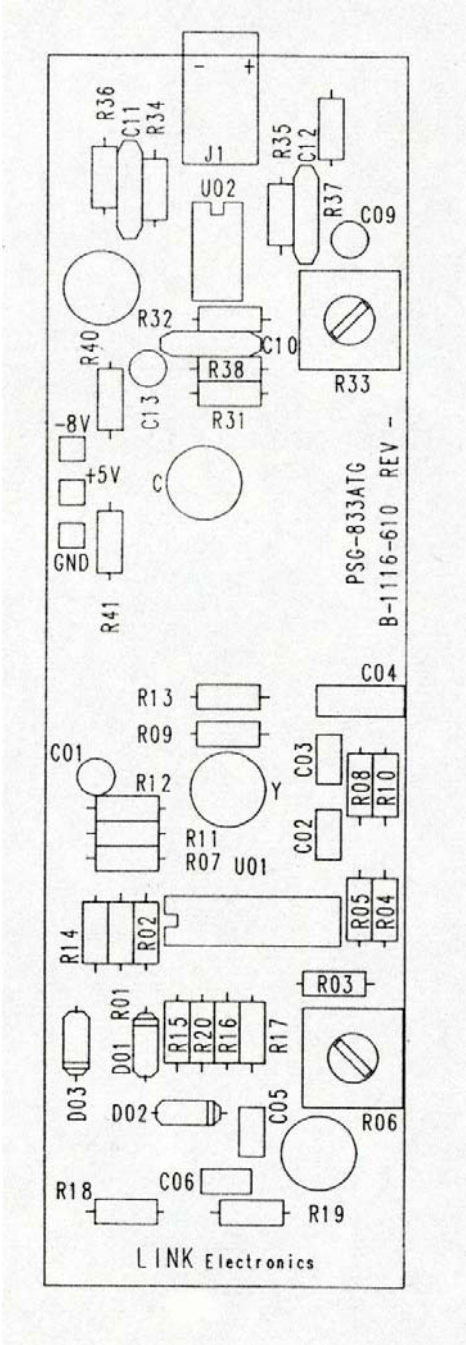
THIS COMPLETES THE SET-UP OF THE IEC-833 AUDIO TONE GENERATOR.

IEC-833 OPTION 1: TECHNICAL DESCRIPTION

AUDIO TONE GENERATOR

The Audio Tone oscillator is built around the National Semiconductor LM3900 Quad Amplifier. Its four sections perform the functions of Voltage Controlled Amplifier (U01A), active 1kHz band-pass filter (U01C) , output driver (U01D), and level detector/feedback (U01B) . The oscillator output is then applied to the balanced output driver, U02, via R31.

Power supplies are provided by the host IEC-833 and are connected at TP1 (-8v), TP2 (+5v), and TP3 (GND).


J1
U02
R36
C11
R34
R35
C12
R37
C09
R32
C10
R33
R40
C13
R38
R31
-8V
+5V
GND
R41
C
PSG-833ATG
B-1116-610 REV -
C04
R13
R09
C01
R12
Y
C03
R08
R10
C02
R11
R07
U01
R14
R02
R05
R04
R03
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R20
R16
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D03
D02
C05
R06
C06
R18
R19
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